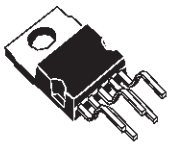
L4925

VERY LOW DROP VOLTAGE REGULATOR

- OPERATING DC SUPPLY VOLTAGE RANGE 6V TO 28V
- TRANSIENT SUPPLY VOLTAGE UP TO 40V
- EXTREMELY LOW QUIESCENT CURRENT
- HIGH PRECISION OUTPUT VOLTAGE
- OUTPUT CURRENT CAPABILITY UP TO 500mA
- VERY LOW DROPOUT VOLTAGE LESS THAN 0.6V
- RESET CIRCUIT SENSING THE OUTPUT VOLTAGE
- PROGRAMMABLE RESET PULSE DELAY WITH EXTERNAL CAPACITOR
- THERMAL SHUTDOWN AND SHORT CIRCUIT PROTECTIONS



Pentawatt

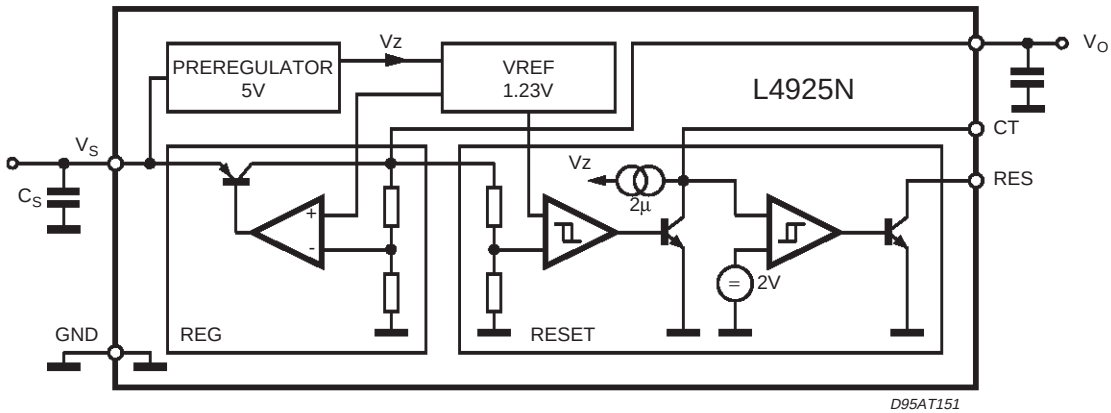
PowerSO20

ORDERING NUMBERS: L4925 (Pentawatt)
L4925PD (PowerSO20)

DESCRIPTION

The L4925 is a monolithic integrated 5V voltage regulator with a very low dropout output and additional functions such as power-on reset and programmable reset delay time. It is designed for supplying microcomputer controlled systems especially in automotive applications.

BLOCK DIAGRAM



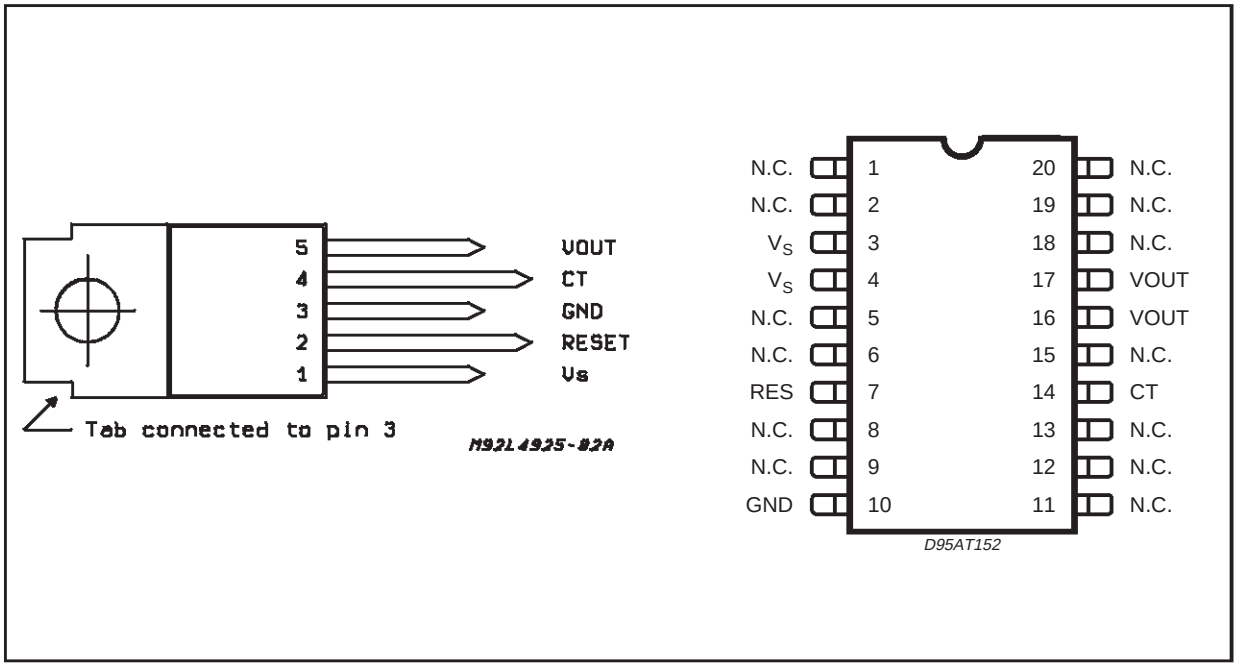
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{SDC}	DC Operating Supply Voltage	28	V
V_{STR}	Transient Supply Voltage (t < 1s)	40	V
I_O	Output Current	internally limited	
V_O	Output Voltage	20	V
V_{RES}	Output Voltage	20	V
I_{RES}	Output Current	5	mA
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Operating Junction Temperature	-40 to 150	°C
$T_{j\text{-}SD}$	Thermal Shutdown-Junction Temperature	165	°C

NOTE:

The circuit is ESD protected according to MIL-STD-883C. According to ISO/DIS 7637 the transients must be clamped with external circuitry (see Application Circuit).

CONNECTION DIAGRAM



THERMAL DATA

Symbol	Parameter		Pentawatt	SO 20	Unit
$R_{th\ j\text{-}amb}$	Thermal resistance junction to ambient	max.	60	77 to 97	°C/W
$R_{th\ j\text{-}case}$	Thermal resistance junction to case	max.	3.5		°C/W

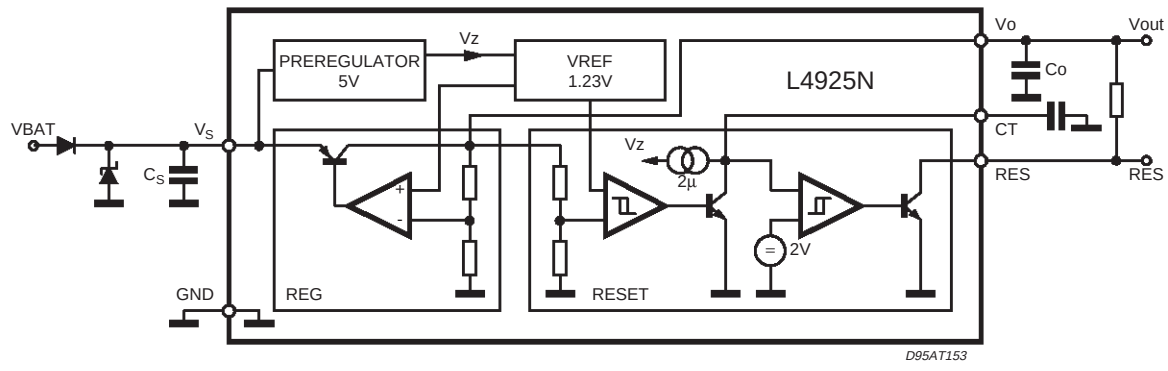
ELECTRICAL CHARACTERISTICS (V_S =14V T_j =–40 to 125°C unless otherwise specified;

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_O	Output Voltage	V_I = 6 to 28V; I_O = 1 to 500mA	4.90	5	5.10	V
V_O	Output Voltage	V_I = 35V; T <1s; I_O = 1 to 500mA			5.50	V
V_{DP}	Dropout Voltage	I_O = 100mA I_O = 500mA		0.2 0.3	0.3 0.6	V V
V_{IO}	Input to Output Voltage Difference in Undervoltage Condition	V_I = 4V; I_O = 100mA			0.5	V
V_{OL}	Line Regulation	V_I = 6 to 28V; I_O = 1 to 1mA			10	mV
V_{OLO}	Load Regulation	I_O = 1 to 500mA			50	mV
I_{LIM}	Current Limit	V_O = 4.5V; V_O = 0; Foldback characteristic	550	1000 250	1500	mA mA
I_{QSE}	Quiescent Current	I_O = 0.3mA		190	360	µA
I_Q	Quiescent Current	I_O = 500mA			20	mA

RESET

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{RT}	Reset Threshold Voltage		4.5		5.2	V
V_{RTH}	Reset Threshold		50	100	200	mV
t_{RD}	Reset Pulse Delay	C_T = 100nF; $t_R \geq$ 100µs	60	100	140	ms
t_{RR}	Reset Reaction Time	C_T = 100nF;		5	30	µs
V_{RL}	Reset Output LOW Voltage	R_{RES} = 10KΩ to V_O; V_S =≥ 3V			0.4	V
I_{RH}	Reset Output HIGH Leakage Current	V_{RES} = 5V			1	µA
V_{CTth}	Delay Comparator Threshold			2		V
$V_{CTth\ hy}$	Delay Comparator Threshold Hysteresis			200		mV

APPLICATION CIRCUIT DIAGRAM



For stability: $C_S \geq$ 1µF; $C_O \geq$ 10µF;ESR < 2.5Ω at 10 KHz
Recommended for application: $C_S = C_O$ = 10µF to 100µF

APPLICATION NOTE

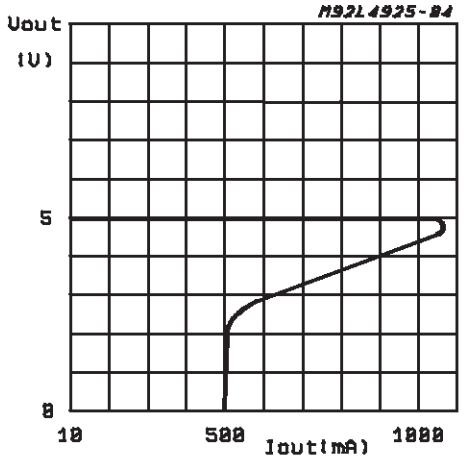
SUPPLY VOLTAGE TRANSIENTS

High supply voltage transients can cause a reset output signal disturbation.

For supply voltage greater than 8V the circuit shows a high immunity of the reset output against supply transients of more than 100V/µs.

For supply voltage lower than 8V, supply transients of more than 0.4V/µs. can cause a reset signal disturbation.

Foldback Characteristics Of Vo



FUNCTIONAL DESCRIPTION

The L4925 is a monolithic integrated voltage regulator, based on the STM modular voltage regulator approach. Several outstanding features and auxiliary functions are implemented to meet the requirements of supplying microprocessor systems in automotive applications.

Nevetrheless, it is suitable also in other applications where the present functions are required. The modular approach of this device allows to get easily also other features and functions when required.

VOLTAGE REGULATOR

The voltage regulator uses an Isolated Collector Vertical PNP transistor as a regulating element. With this structure very low dropout voltage at currents up to 500mA is obtained.

The dropout operation of the standby regulator is maintained down to 3V input supply voltage. The output voltage is regulated up to the transient input supply voltage of 35V. With this feature no functional interruption due to overvoltage pulses is generated.

The typical curve showing the standby output voltage as a function of the input supply voltage is shown in fig. 1.

The current consumption of the device (quiescent current) is less than 250µA.

To reduce the quiescent current peak in the undervoltage region and to improve the transient response in this region, the dropout voltage is controlled.

The quiescent current as a function of the supply input voltage is shown in fig. 2.

Figure 1: Output Voltage vs. Input Voltage

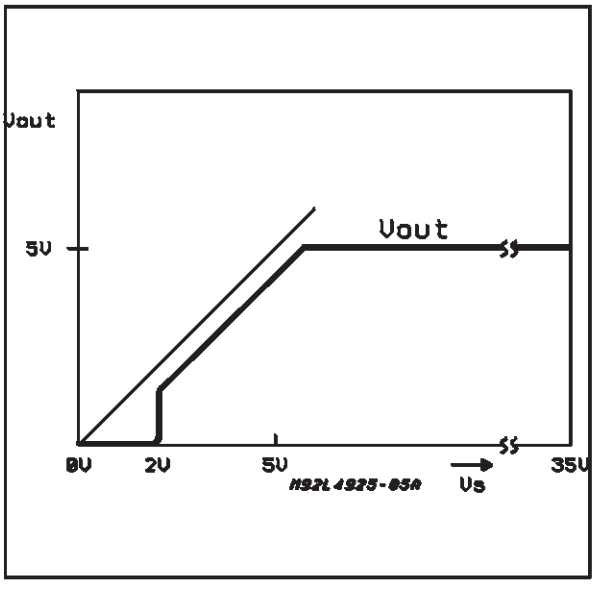
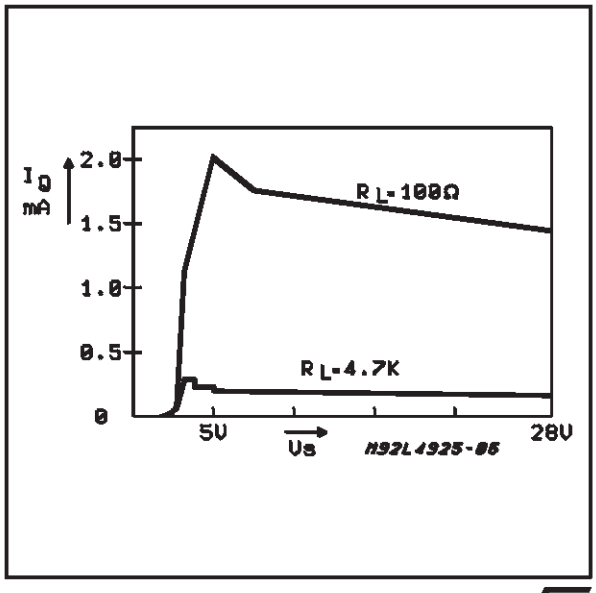


Figure 2: Quiescent Current vs. Supply Voltage



RESET CIRCUIT

The block circuit diagram of the reset circuit is shown in Figure 3. The reset circuit supervises the output voltage. The reset threshold of 4.5V is defined with the internal reference voltage and standby output divider.

The reset pulse delay time t_{RD}, is defined with the charge time of an external capacitor C_T:

$$t_{RD} = \frac{C_T \times 2V}{2\mu A}$$

The reaction time of the reset circuit originates from the discharge time limitation of the reset capacitor C_T and it is proportional to the value of C_T.

The reaction time of the reset circuit increases the noise immunity.Standby output voltage drops below the reset threshold only a bit longer than the reaction time results in a shorter reset delay time. The nominal reset delay time will be generated for standby output voltage drops longer than approximately 50µs. The typical reset output waveforms are shown in Figure 4.

Figure 3

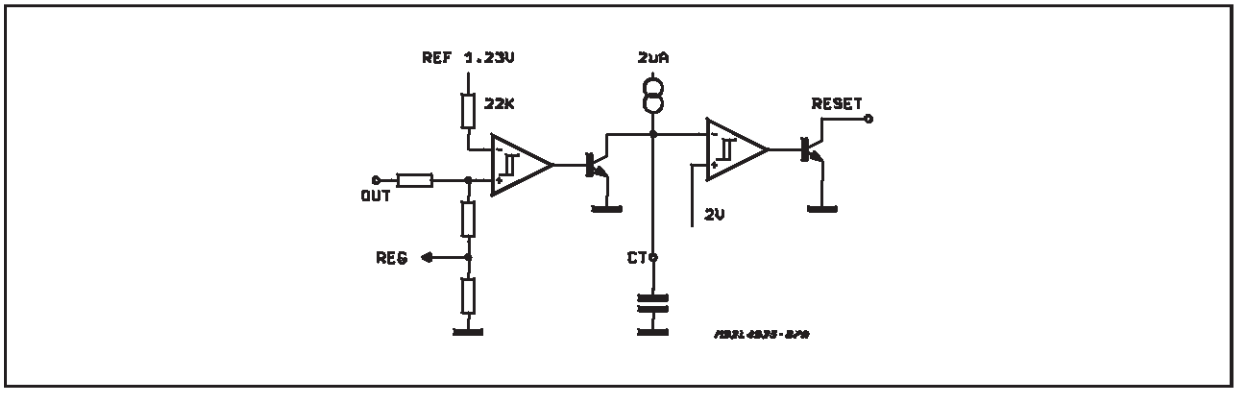
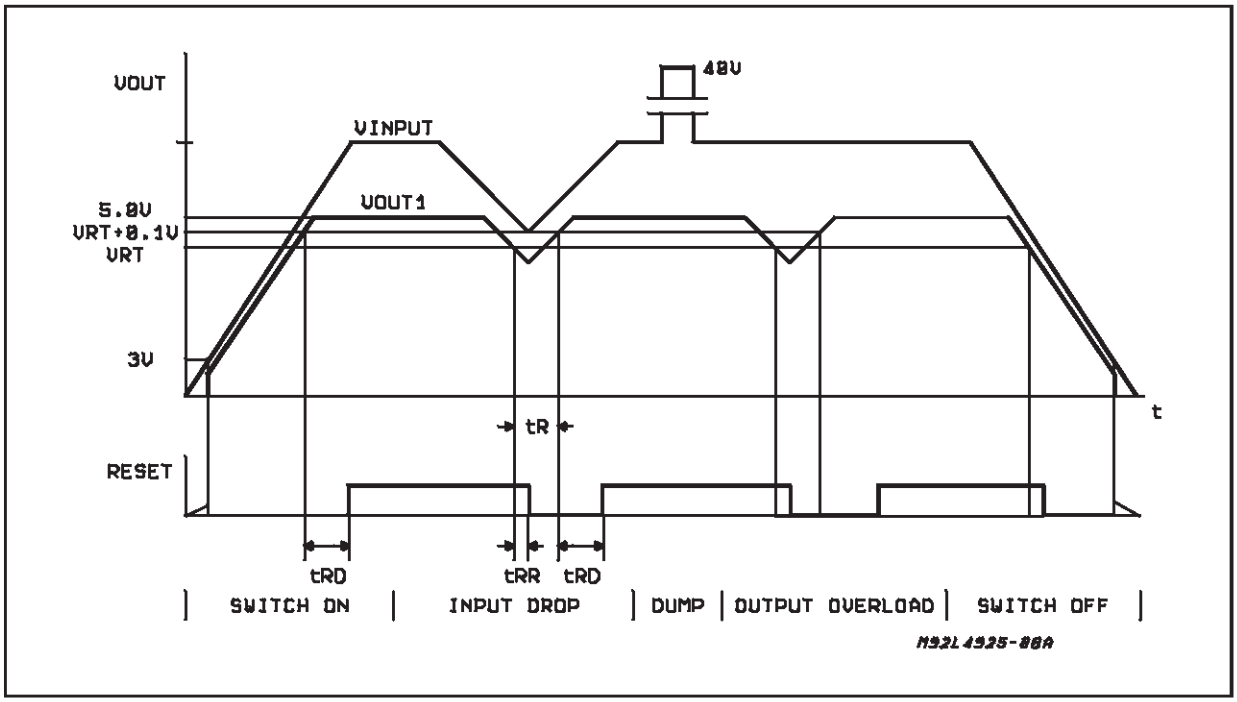
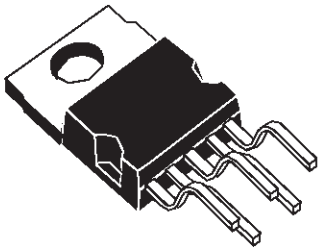


Figure 4

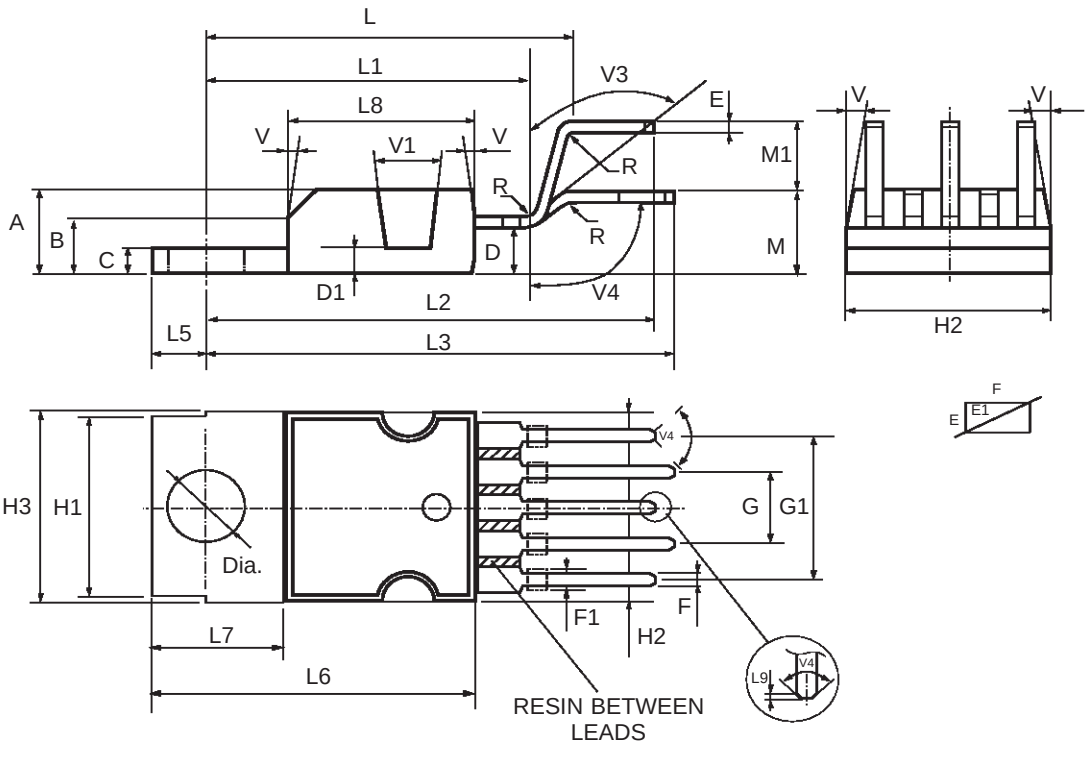


DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			4.8			0.189
C			1.37			0.054
D	2.4		2.8	0.094		0.110
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
E1	0.76		1.19	0.030		0.047
F	0.8		1.05	0.031		0.041
F1	1		1.4	0.039		0.055
G	3.2	3.4	3.6	0.126	0.134	0.142
G1	6.6	6.8	7	0.260	0.268	0.276
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L	17.55	17.85	18.15	0.691	0.703	0.715
L1	15.55	15.75	15.95	0.612	0.620	0.628
L2	21.2	21.4	21.6	0.831	0.843	0.850
L3	22.3	22.5	22.7	0.878	0.886	0.894
L4			1.29			0.051
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.260
L9		0.2			0.008	
M	4.23	4.5	4.75	0.167	0.177	0.187
M1	3.75	4	4.25	0.148	0.157	0.167
V4	40° (typ.)					

OUTLINE AND MECHANICAL DATA



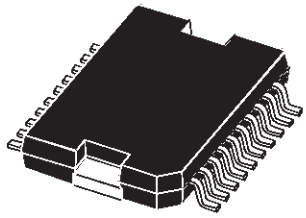
Pentawatt V



DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			3.6			0.142
a1	0.1		0.3	0.004		0.012
a2			3.3			0.130
a3	0		0.1	0.000		0.004
b	0.4		0.53	0.016		0.021
c	0.23		0.32	0.009		0.013
D (1)	15.8		16	0.622		0.630
D1	9.4		9.8	0.370		0.386
E	13.9		14.5	0.547		0.570
e		1.27			0.050	
e3		11.43			0.450	
E1 (1)	10.9		11.1	0.429		0.437
E2			2.9			0.114
E3	5.8		6.2	0.228		0.244
G	0		0.1	0.000		0.004
H	15.5		15.9	0.610		0.626
h			1.1			0.043
L	0.8		1.1	0.031		0.043
N	10° (max.)					
S	8° (max.)					
T		10			0.394	

(1) "D and F" do not include mold flash or protrusions.
- Mold flash or protrusions shall not exceed 0.15 mm (0.006").
- Critical dimensions: "E", "G" and "a3"

OUTLINE AND MECHANICAL DATA



JEDEC MO-166

PowerSO20